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CLAIMS

1. An impact energy transmitting arrangement (10; 70;140) for transmitting energy, which arises during impact between a vehicle (12) on which said arrangement is mounted and a foreign body, to a vehicle structure (14), said arrangement (10; 70; 140) comprising first means (18; 72; 142) displaceable in a first direction (A; B), and second means (20; 74; 144) adapted for co-operation with said first means, said first and second means being operable such that the arrangement, below a first predetermined value of a parameter representative of the energy to be transmitted, presents a first resistance-to-displacement value and, above said first predetermined value, presents a second resistance-to-displacement value, the first resistance-to-displacement value being greater than the second resistance-to-displacement value.

2. The arrangement (10; 70; 140) as claimed in claim 1, wherein said first and second means (18; 72; 142; 20; 74; 144) are further operable such that the arrangement, above a second predetermined value of a parameter representative of the energy to be transmitted, said second predetermined value being higher than said first predetermined value, presents a third resistance-to-displacement value, the third resistance-to-displacement value being greater than the second resistance-to-displacement value.

3. The arrangement (10; 70; 140) as claimed in claim 1 or claim 2, wherein said energy to be transmitted which arises during impact effects acceleration of said first means (18; 72; 142).

4. The arrangement (10; 70) as claimed in any one of the preceding claims, wherein said first direction (A) in which said first means (18; 72) is displaceable is rectilinear.

5. The arrangement (10; 70) as claimed in any one of the preceding claims, wherein said first means (18; 72) is an elongate member (28; 78) having a longitudinal extension in said first direction (A).

6. The arrangement (10) as claimed in any one of the preceding claims, wherein said second means (20) is biased towards said elongate member (28) such that, during displacement of said elongate member (18) in said first direction, said second means (20) is urged to accelerate towards said elongate member (18) in a second direction substantially perpendicular to said first direction at a predetermined rate.

7. The arrangement (10) as claimed in claim 6, wherein said elongate member (28) has a transverse extension in said second direction, said elongate member (28) having a first region (32) having a first transverse dimension (34) in said second direction, a second region (36) having a second transverse dimension (38) in said second direction less than said first transverse dimension (34), and a third region (40) located between said first and second regions (32; 36), said third region (40) having a minimum third transverse dimension (42) in said second direction which is less than said second transverse dimension (38).

8. The arrangement (10) as claimed in claim 7, wherein said third region (40) abuts said second region (36) at a location at which said third region (40) has said minimum third transverse dimension (42) such that an abutment shoulder (44) is formed.

9. The arrangement (10) as claimed in claim 8, wherein said third region (40) abuts said first region (32) at a location (46) at which said third region (40) has a maximum third transverse dimension in said second direction having a value substantially equal to said first transverse dimension (34) of said first region (32), said third region (40) having a surface (48) which tapers from said maximum to said minimum third transverse dimension (42) along a first distance in said first direction.

10. The arrangement (10) as claimed in claim 9, wherein said second means (20) comprises at least one abutment member (50) having a first end (52) which, when said arrangement (10) is in a non-influenced condition, abuts against said first region (32) of said elongate member (28).

11. The arrangement (10) as claimed in claim 10, wherein during impact in which energy arises having a value below said first predetermined value of a parameter representative of the energy to be transmitted, said elongate member (28) is caused to accelerate past said first end (52) of said at least one abutment member (50) at a rate such that said at least one abutment member (50) is caused to abut against said abutment shoulder (44).

12. The arrangement (10) as claimed in claim 10, wherein during impact in which energy arises having a value above said first predetermined value of a parameter representative of the energy to be transmitted, said elongate member (28) is caused to accelerate past said first end (52) of said at least one abutment member (50) at a rate such that said first end (52) of said at least one abutment member (50) makes no contact with said third region (40) of said elongate member (28) and is caused to abut against said second region (36) of said elongate member (28).

13. The arrangement (10) as claimed in claim 10, wherein said arrangement (10) is provided with actuable retarding means (62) acting on said elongate member (28) such that during impact in which energy arises having a value above said second predetermined value of a parameter representative of the energy to be transmitted, said actuable retarding means (62) is actuated so that said elongate member (28) is caused to accelerate past said first end (52) of said at least one abutment member (50) at a rate such that said at least one abutment member (50) is caused to abut against said abutment shoulder (44).

14. The arrangement (10) as claimed in any one of claims 7 to 13, wherein said arrangement (10) is provided with a housing (22) comprising a first guide portion (24) extending in said first direction, said first guide portion (24) being adapted to guide said first region (32) of said elongate member (28), and a second guide portion (26) for guiding said second means (20), said housing (22) defining a self-contained unit.

15. The arrangement (70) as claimed in any one of claims 1 to 5, wherein said second means (74) is carried by said elongate member (78).

16. The arrangement (70) as claimed in claim 15, wherein said second means is constituted by at least one pivotal abutment member (100) having a first abutment end (104) and a second abutment end (106).

17. The arrangement (70) as claimed in claim 16, wherein said arrangement further comprises a housing (76) having an inner mantle surface (107) delimiting a through hole through which said elongate member (78) is arranged to pass, said second abutment end (106) being biased towards said inner mantle surface (107) of said housing.

18. The arrangement (70) as claimed in claim 17, wherein said housing (70) is provided with a first abutment surface (118, 122) for co-operation with said first abutment end (104) of said pivotal abutment member (100) to provide said third resistance-to-displacement value, and a second abutment surface (124) for co-operation with said second abutment end (104) of said pivotal abutment member (100) to provide said first resistance-to-displacement value.

19. The arrangement (70) as claimed in claim 18, wherein said first abutment surface (118) is formed by a portion of a first recess (120) in said inner mantle surface (107) and said second abutment surface (124) is formed by a portion of a second recess (126) in said inner mantle surface.

20. The arrangement (70) as claimed in claim 19, wherein during impact in which energy arises having a value above said first predetermined value of a parameter representative of the energy to be transmitted, said elongate member (78) is

caused to accelerate such that said second abutment end (106) of the pivotal abutment member (100) will travel past said second abutment surface (124) of said second recess (126) without said second abutment end (106) making contact with the inner mantle surface of said second recess.

21. The arrangement (140) as claimed in any one of claims 1 to 3, wherein said first direction (B) in which said first means (142) is displaceable is a direction of rotation.

22. The arrangement (140) as claimed in claim 21, wherein said first means (142) is a pivotal member (146) arranged to be pivotally mounted to said vehicle structure at a pivot point (150), said pivotal member (146) presenting a first surface (168) directed radially away from said pivot point (150).

23. The arrangement (140) as claimed in claim 22, wherein said second means (144) is constituted by an abutment member (178) biased towards said first surface (168) of said pivotal member (146).

24. The arrangement (140) as claimed in claim 23, wherein said first surface (168) of said pivotal member (146) is provided with a recess (170) having an abutment surface (176), said recess being arranged to accommodate said abutment member (178) to provide said first resistance-to-displacement value.

25. The arrangement (140) as claimed in claim 24, wherein during impact in which energy arises having a value above said first predetermined value of a parameter representative of the energy to be transmitted, said pivotal member (146) is caused to accelerate such that said recess (170) of the pivotal member (146) will travel past said abutment member (178) without said abutment member making contact with said abutment surface (176) of said recess (170).

26. The arrangement (10; 70; 140) as claimed in any one of the preceding claims, wherein the velocity of the vehicle corresponding to said first predetermined value of a parameter representative of the energy to be transmitted is below 30 km/h, preferably below 20 km/h and is most preferably about 15 km/h.

27. The arrangement (10; 70; 140) as claimed in any one of claims 2 to 26, wherein the velocity of the vehicle corresponding to said second predetermined value of a parameter representative of the energy to be transmitted is above 40 km/h, preferably above 50 km/h and is most preferably about 60 km/h.

28. The arrangement (10; 70; 140) as claimed in claim 11 or 12, wherein said arrangement is provided with return means (60; 136; 184) acting on said first means (18; 72; 142) to return said arrangement to said non-influenced condition.

29. A method of reducing risk of pedestrian injury in a collision between a vehicle (12) and a pedestrian, said vehicle being provided in an impact energy transmitting arrangement (10; 70; 140) for transmitting energy, which arises during impact between said vehicle and a foreign body, to the vehicle structure (14), the method comprising the steps of:

operating said arrangement such that, below a first predetermined value of a parameter representative of the energy to be transmitted, said arrangement presents a first resistance-to-displacement value and,

operating said arrangement such that, above said first predetermined value, said arrangement presents a second resistance-to-displacement value, the first resistance-to-displacement value being greater than the second resistance-to-displacement value.